

Urban planning, environmental exposures and health: how communities can effect change

Mark J Nieuwenhuijsen
CREAL

HUMAN TIMELINE



100000 BC

**Hunter
gatherers**



8000 BC

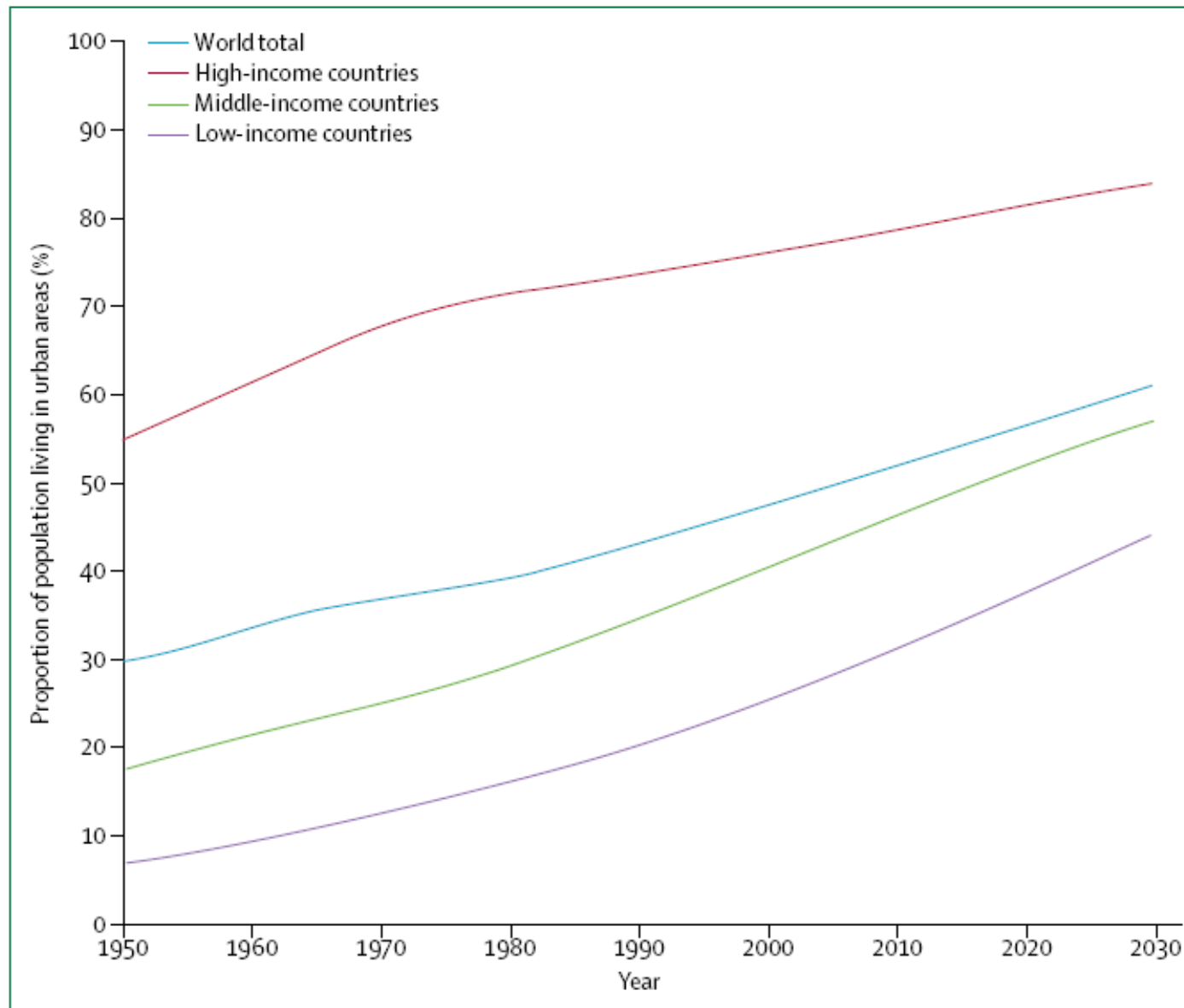
Agriculture



2000 AC

**City
dwellers**

PROPORTION OF THE WORLD POPULATION LIVING IN URBAN AREAS



“ Cities have long been known to be society’s predominant engine of innovation and wealth creation, yet they are also its main source of crime, pollution, and disease ”

Bettencourt et al 2007



SHENZHEN, CHINA



BEIRUT, LEBANON



BUENOS AIRES, ARGENTINA

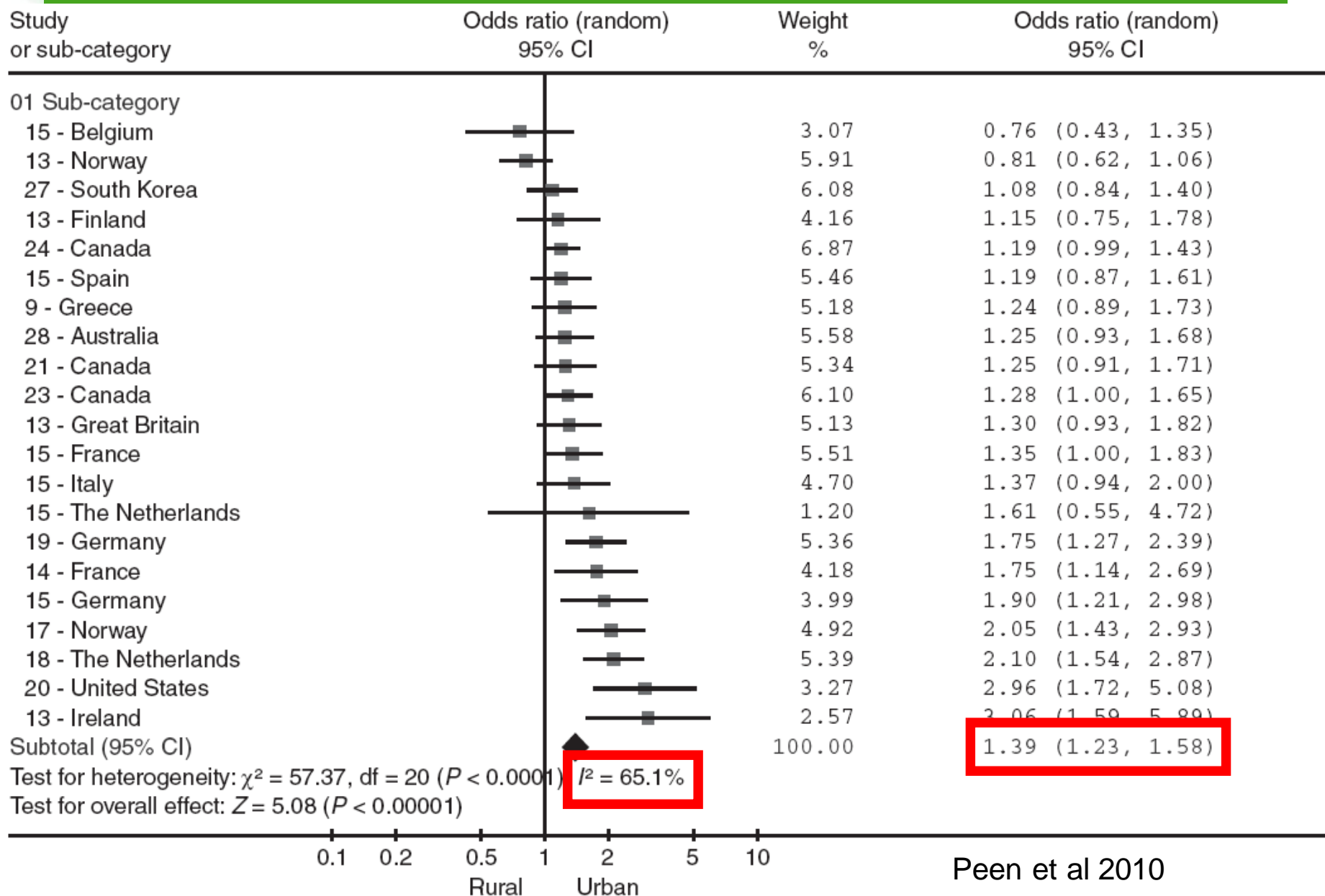


KUWAIT CITY, KUWAIT



ATHENS, GREECE

MOOD DISORDERS RURAL VS URBAN





Pollution

VW scandal caused nearly 1m tonnes of extra pollution, analysis shows

- Emissions could have far greater impact in Europe, where almost half passenger cars are diesel, than the US
- Company bosses to meet on Wednesday to decide response to emissions-rigging scandal

Karl Mathiesen and Arthur Neslen

Wednesday 23 September 2015
07.46 BST



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8,645 1,611

Save for later



PLANETA FUTURO



Bicicletas y motos en las calles de Hanoi. / SIMONE D. MCCOURTIE (WORLD BANK)

¿Diésel o gasolina? Mucho más que un problema de emisiones

D. ROJAS-RUEDA Y M. NIEUWENHUIJSEN (CREAL- ISGLOBAL) 18

Además de contaminación, los coches emiten ruido y ocupan parte importante del espacio público que podría dedicarse a otros usos



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EL PAÍS • RECOMIENDA

Rabin: un estadista, no un político

URI DROMI

El coronel retirado, portavoz israelí en los noventa, recuerda la talla del ex primer ministro, asesinado hoy hace 20 años



Soy autónomo y estoy enfermo. ¿Puedo cobrar algo?

LAURA DELLE FEMMINE | Madrid

La prestación por incapacidad temporal es la opción del trabajador por cuenta propia



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447 000 premature deaths per year from air pollution in the EU

2014-11-19



While policies have improved air quality overall, air pollution is still the main environmental health hazard, resulting in high costs for health care systems, unhealthy workers and close to 450,000 premature deaths in the EU in 2011, according to a new report from the European Environment Agency (EEA). EEA's annual air quality report collates data from official monitoring stations across Europe. It

[Publications](#)

APC 32
Carbon C
in Norwa
landing th
The Norweg
depends larg
sector.

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12 Factsheet
Gasping
Twelve facts
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heating, eco

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The contribution of outdoor air pollution sources to premature mortality on a global scale

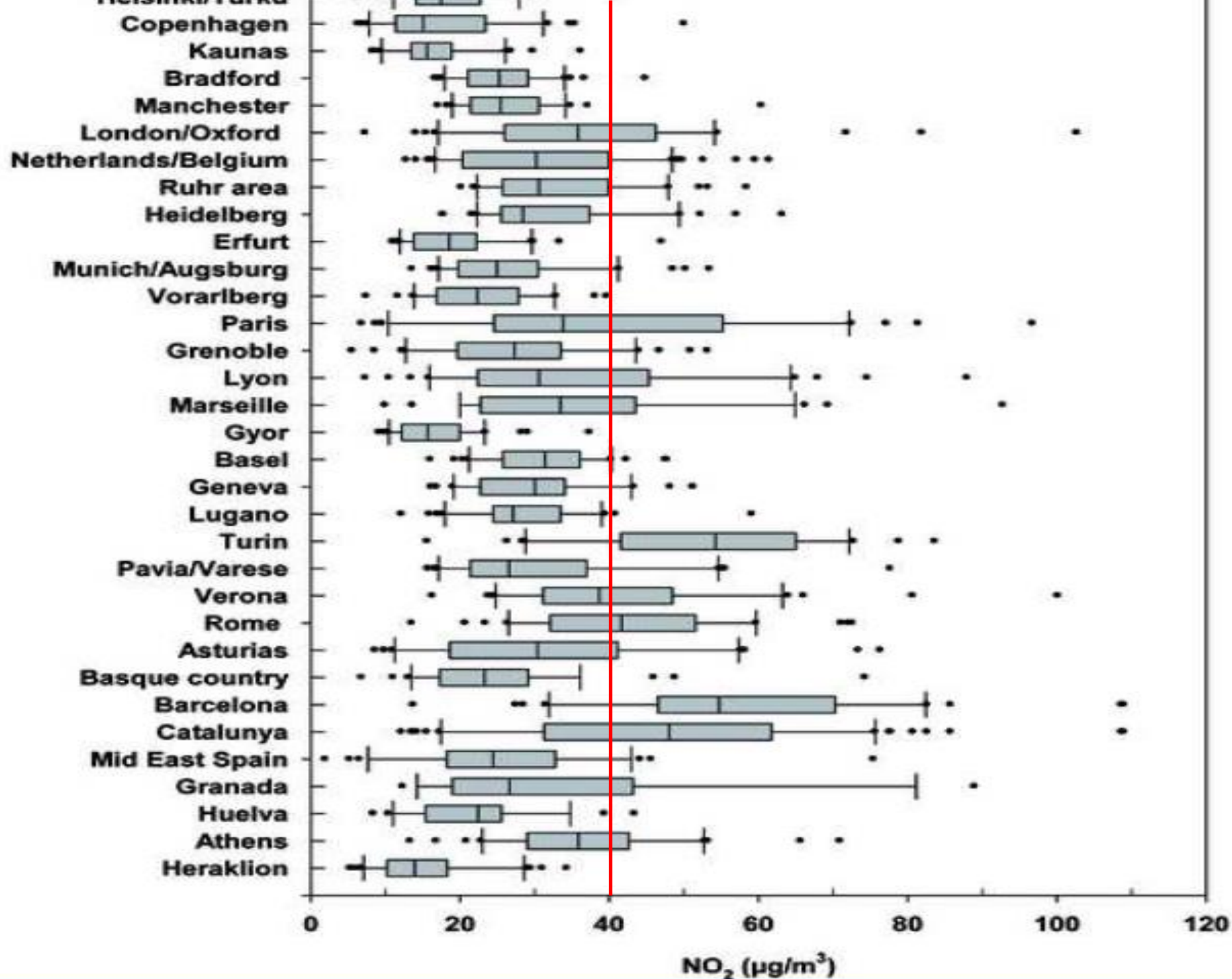
J. Lelieveld^{1,2}, J. S. Evans^{3,4}, M. Fnais⁵, D. Giannadaki² & A. Pozzer¹

Assessment of the global burden of disease is based on epidemiological cohort studies that connect premature mortality to a wide range of causes^{1–5}, including the long-term health impacts of ozone and fine particulate matter with a diameter smaller than 2.5 micrometres (PM_{2.5})^{3–9}. It has proved difficult to quantify premature mortality related to air pollution, notably in regions where air quality is not monitored, and also because the toxicity of particles from various sources may vary¹⁰. Here we use a global atmospheric chemistry model to investigate the link between premature mortality and seven emission source categories in urban and rural environments. In accord with the global burden of disease for 2010 (ref. 5), we calculate that outdoor air pollution, mostly by PM_{2.5}, leads to 3.3 (95 per cent confidence interval 1.61–4.81) million premature deaths per year worldwide, predominantly in Asia. We primarily assume that all particles are equally toxic⁵, but also include a sensitivity study that accounts for differential toxicity. We find that emissions from residential energy use such as heating and cooking, prevalent in India and China, have the largest impact on premature mortality globally, being even more dominant if carbonaceous particles are assumed to be most toxic. Whereas in much of the USA and in a few other countries emissions from traffic and power generation are important, in eastern USA, Europe, Russia and East Asia agricultural emissions make the largest relative contribution to PM_{2.5}, with the estimate of overall health impact depending on assumptions regarding particle toxicity. Model projections based on a business-as-usual emission scenario indicate that the contribution of outdoor air pollution to

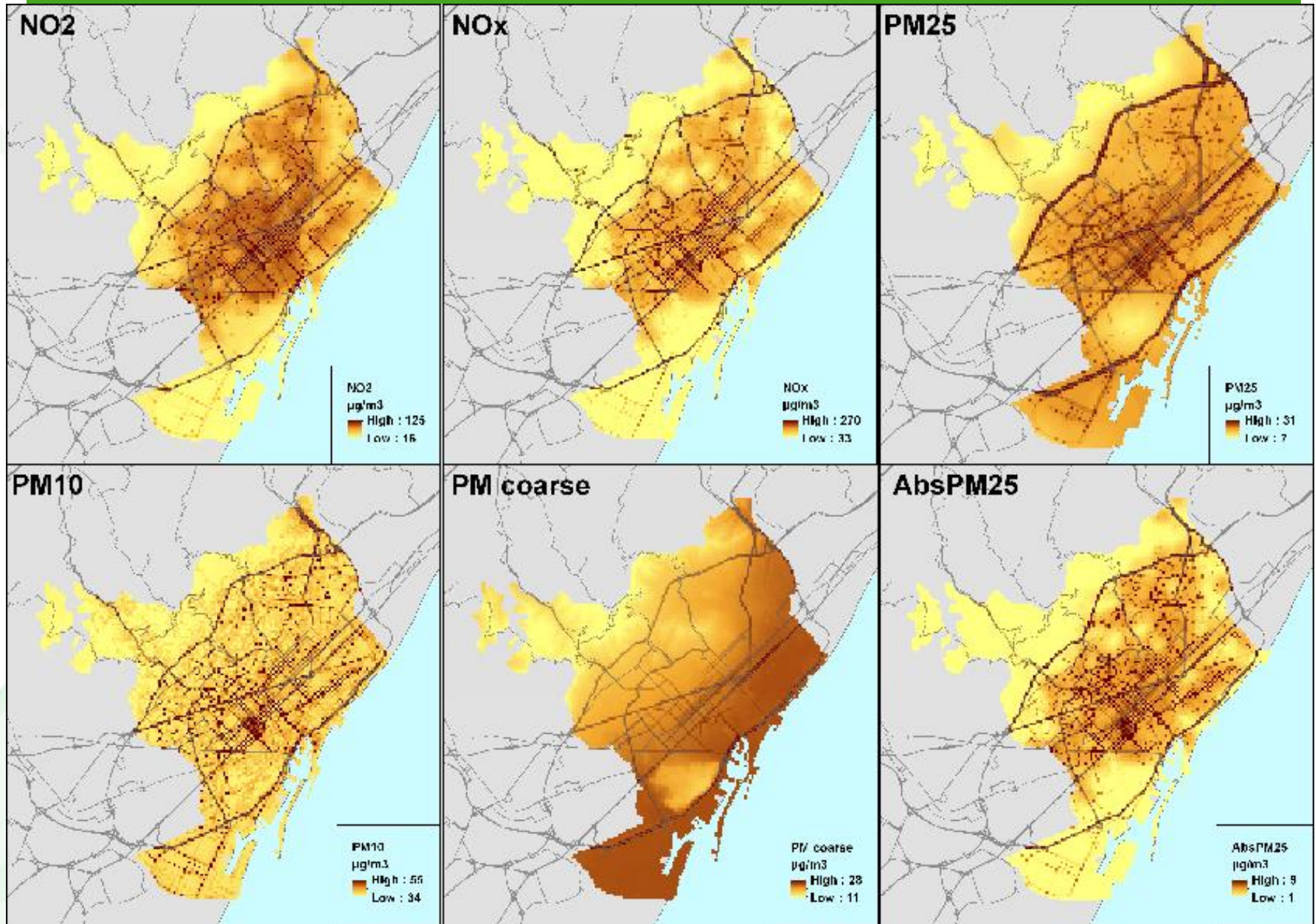
GBD⁵ we also include desert dust (which is largely natural) with PM_{2.5}; hence strictly speaking we assess the effects of atmospheric composition.

The air quality guidelines of the World Health Organization (WHO) and national regulatory policies are based on exposure response functions that rely on PM_{2.5} mass concentrations, implicitly treating all fine particles as equally toxic without regard to their source and chemical composition. However, expert elicitation suggests that carbonaceous particles are more toxic than crustal material, nitrates and sulfates¹⁰. A recent study²⁵ finds that PM_{2.5} from coal combustion leads to increased mortality risk from cardiovascular disease and LC, but that the evidence is much weaker for other sources, whereas estimates using non-specific PM_{2.5} mass alone may underestimate the total effect of PM_{2.5} on mortality. Further, this study did not find support for mortality from biomass combustion and soil dust particles²⁵. However, this and a subsequent report by the Health Effects Institute in the USA also note that there were only a limited number of cities in these investigations where these sources and components were likely to be measured consistently^{26,27}. While the evidence for differential toxicity is far from conclusive, we conducted a secondary analysis assuming that carbonaceous PM_{2.5} is five times more toxic than inorganic particles, though maintaining the same overall health impact of PM_{2.5}.

We have calculated premature mortality linked to CEV, COPD, IHD and LC for adults ≥ 30 years old, and ALRI for infants < 5 years old (Table 1 and Extended Data Tables 1 and 2). Our estimate of the global PM_{2.5}-related mortality in 2010 is 3.15 million people with a 95% con-



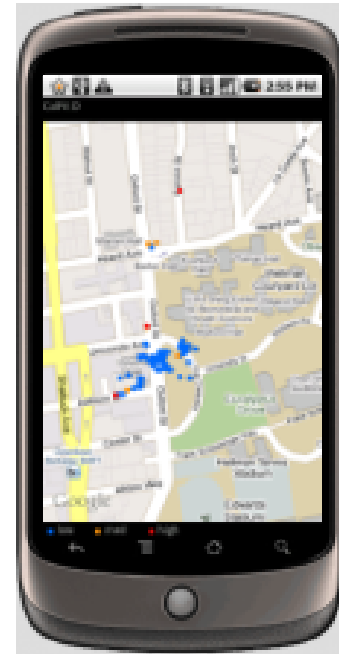
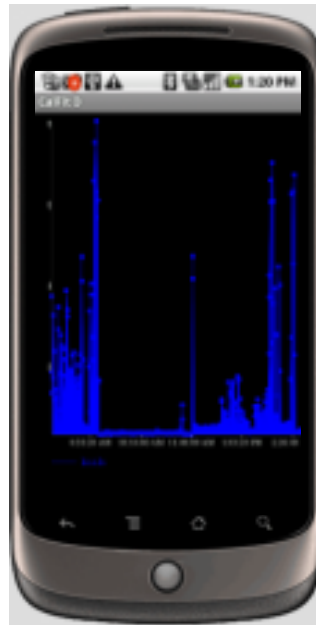
VARIATION IN AIR POLLUTION THROUGHOUT THE CITY



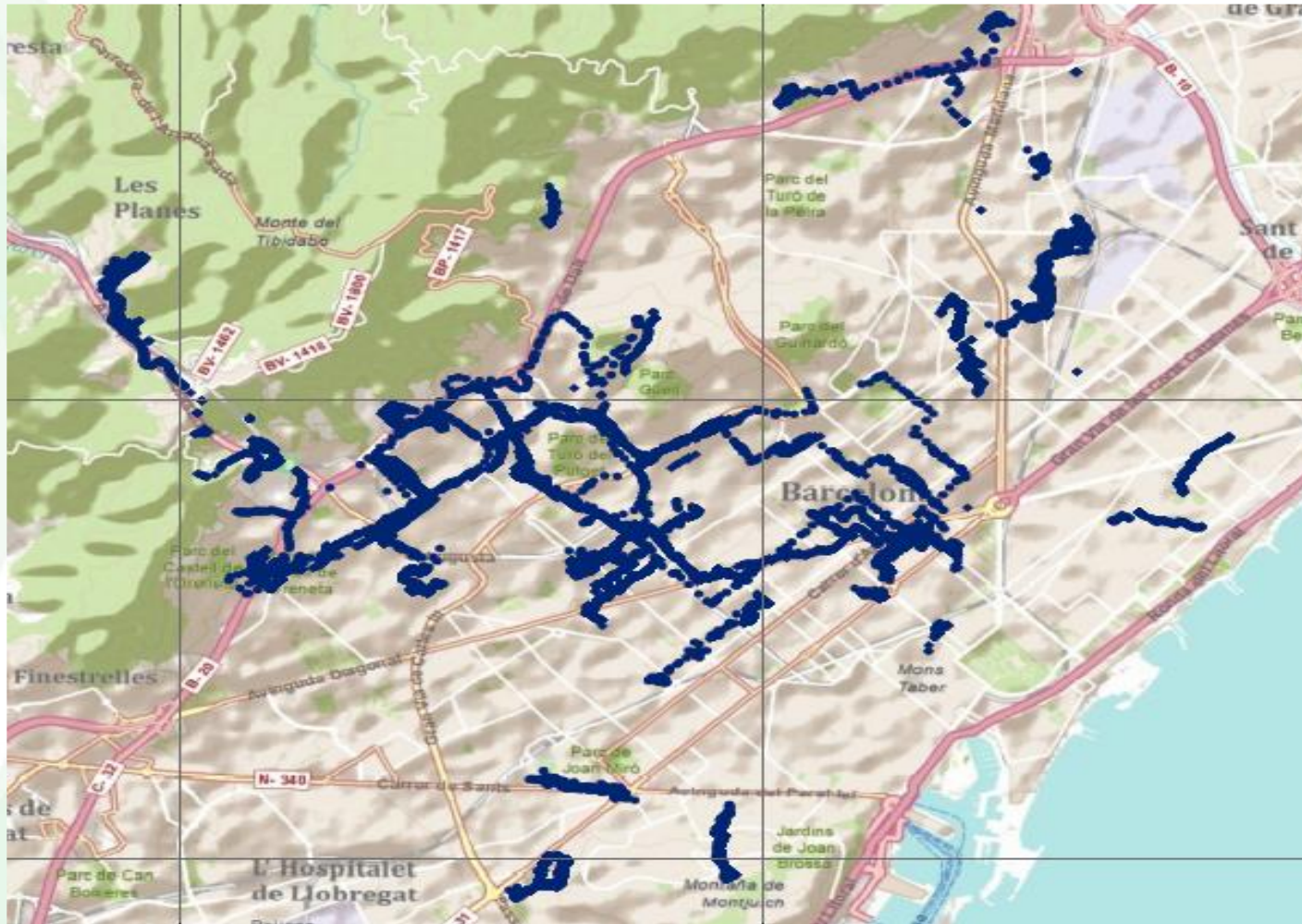
PERSONAL ASSESSMENT OF AIR POLLUTION



Microaethalometer



BREATHE

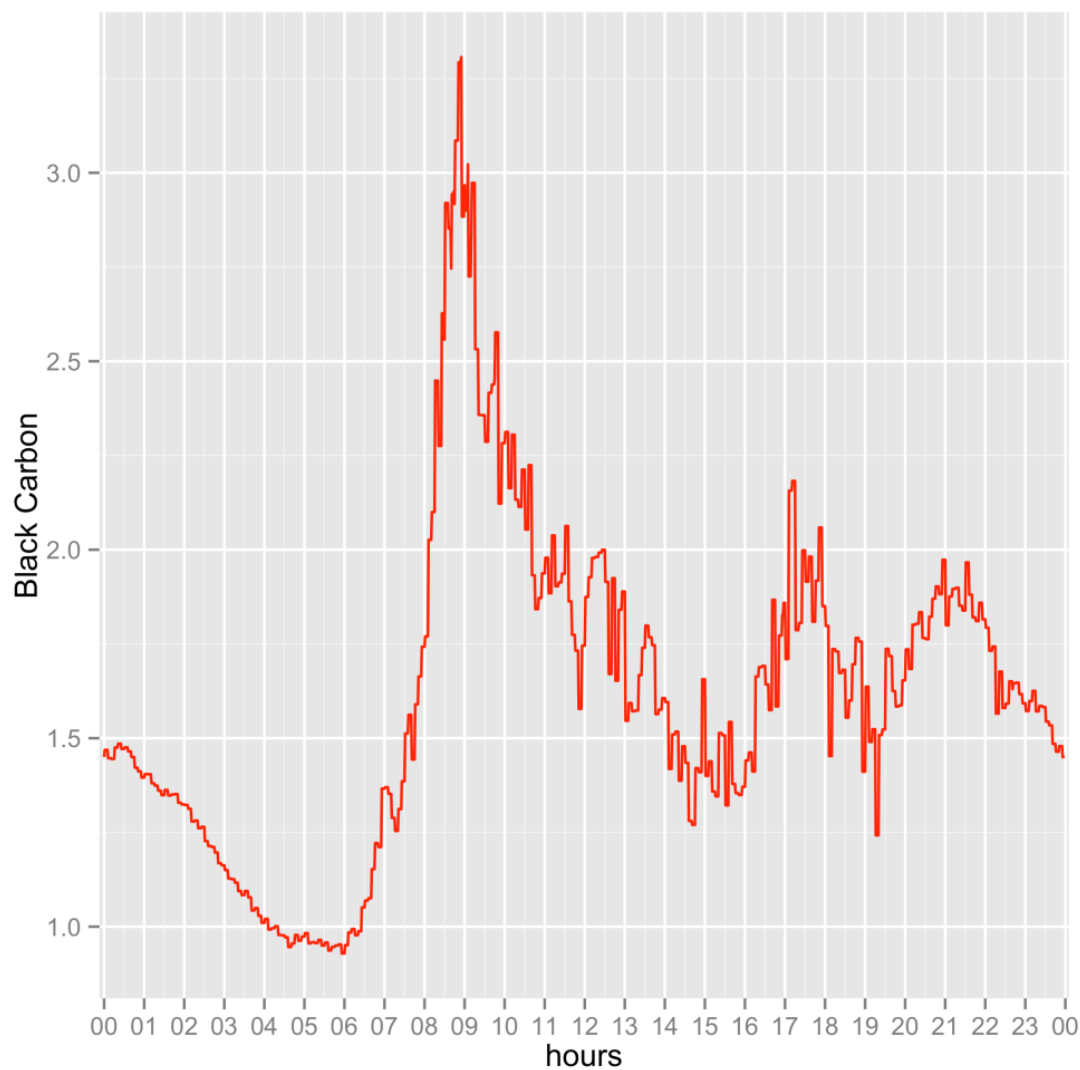


PERSONAL BLACK CARBON LEVELS BY MICROENVIRONMENT

	Duration (hrs)	GM (ng/m ³)	GSD	Contribution (%)
Overall		1.4	1.6	
Home	15	1.3	1.8	46%
School	8	1.6	1.7	32%
Commute	0.7	2.8	2.2	13%

Correlation home-school 0.47

Average personal black carbon levels over the day



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AirCasting is an open-source, end-to-end solution for collecting, displaying, sharing health and environmental data using your smartphone. The platform includes a variety of wearable sensors that detect changes in your environment and physiology, including a palm-sized air quality monitor called the AirBeam, the **AirCasting Android app**, the AirCasting website, and wearable LED accessories. By documenting and leveraging health and environmental data to inform personal decision-making and public policy, the AirCasting platform empowers citizen scientists and changemakers.

GET YOUR AIRBEAM ON
KICKSTARTER!



THE AIRCASTING PLATFORM

HOW IT WORKS



your air quality sensor

AIRBEAM



measure aerosols with your smart

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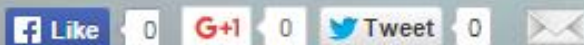
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[FAQ](#)

[ME](#)

(Nederlands) Het iSPEX project gaat Europa in

Posted 1 September 2015 by [Hester](#) & filed under [news](#).



(Nederlands) Klimaatjournalist Bernice Notenboom op weg naar Groenland met iSPEX op zak

Posted 8 May 2015 by [Hester](#) & filed under [news](#).



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JAARPRIJS
2012**

Contact info

info@ispex.nl

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PRACTIQUES L'AIRE LLIUR

BCN RESPIRA

Un experimento ciudadano para medir la concentración de aerosoles en Barcelona.

Del 15 de Septiembre al 15 de Octubre 2015



CITI-SENSE

Development of sensor-based Citizens' Observatory Community for improving quality of life in cities

Project website: www.citi-sense.eu

Starting date: 01/10/2012

Duration: 48 months

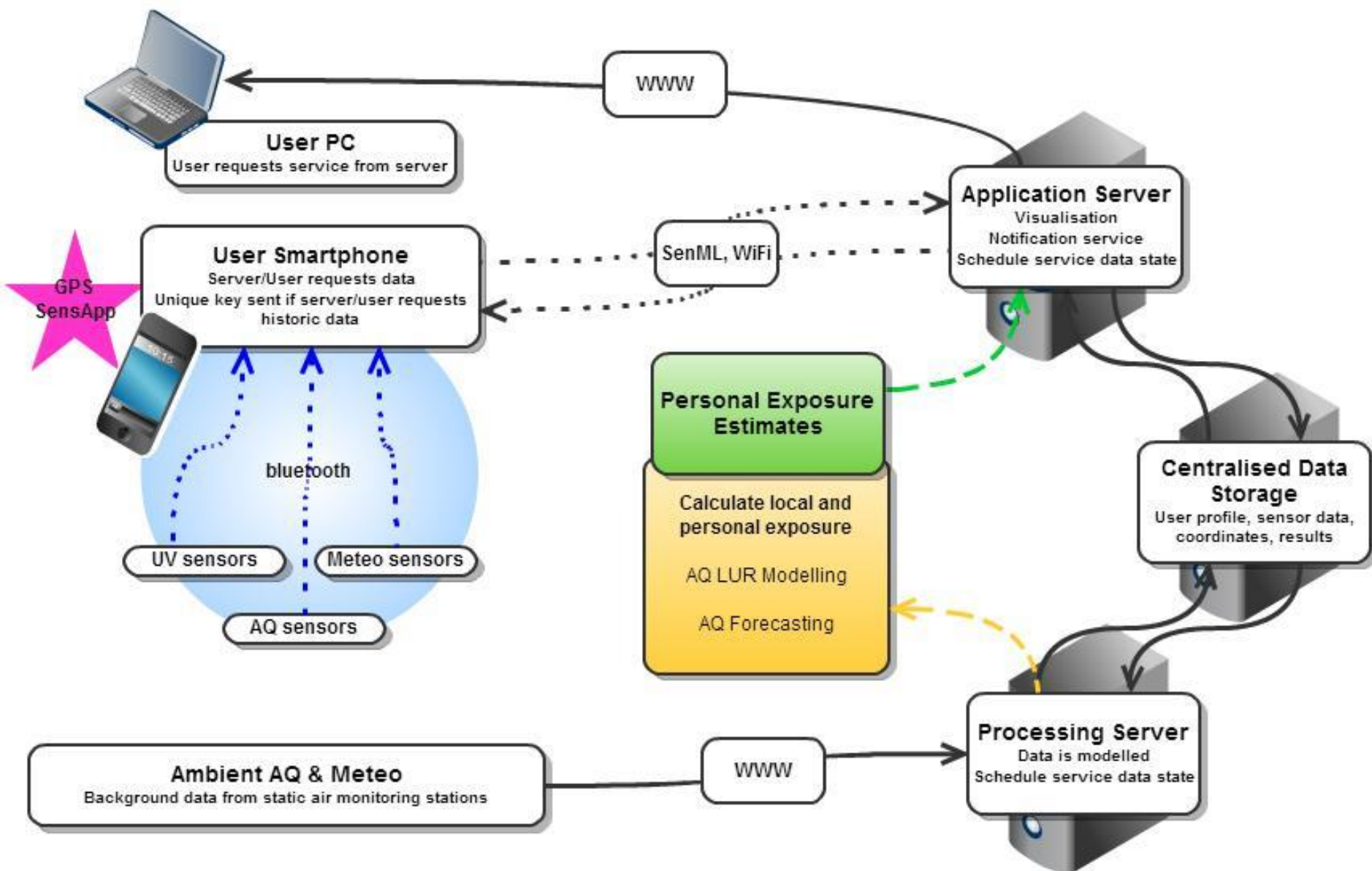
Budget: 12M€

Participants: 27 organizations (11 SMEs, 4 Universities, 12 Research institutes)

Call: FP7-ENV-2012.6.5-1 Developing community-based environmental monitoring and information systems using innovative and novel earth observation applications

CITI-SENSE project
Grant agreement n°: 308524





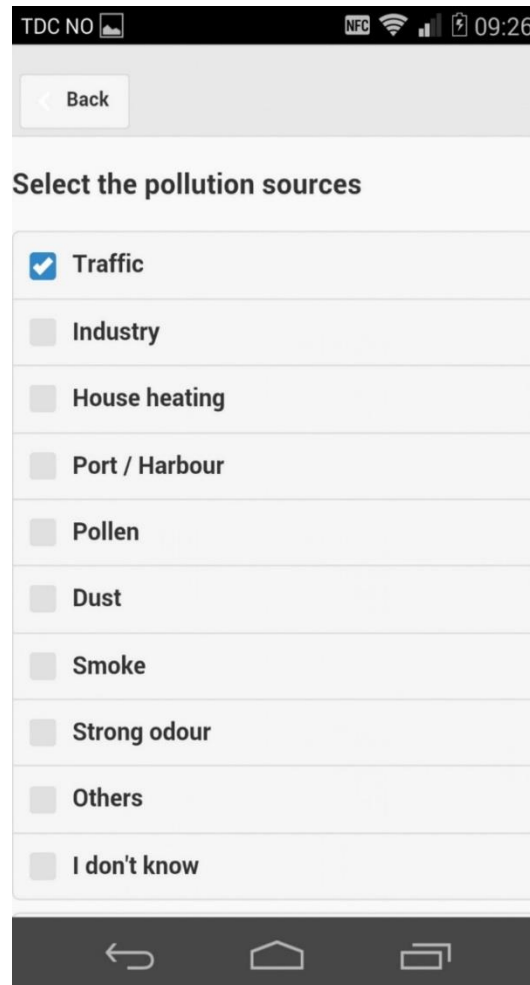
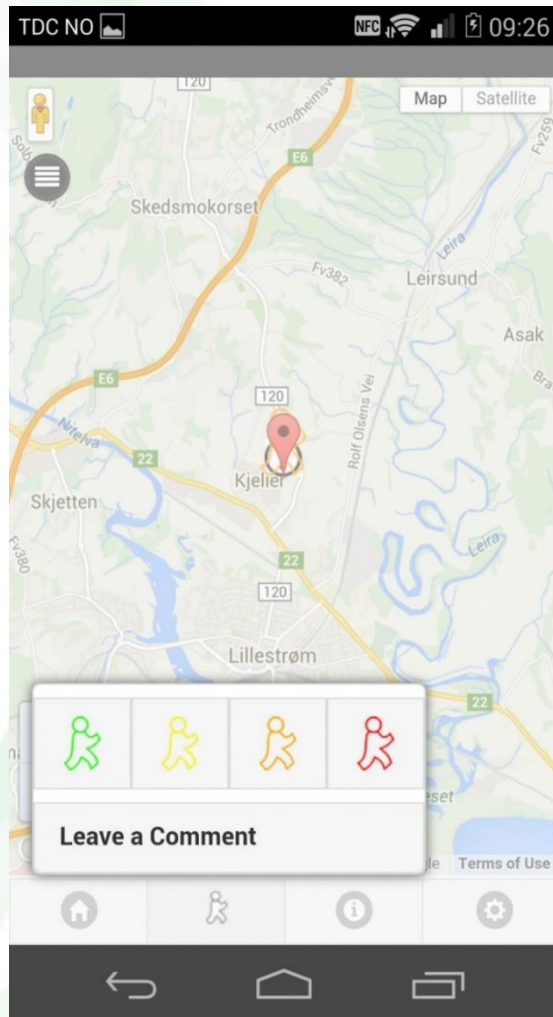
Step 1: Mobile sensor data transmitted to application server.

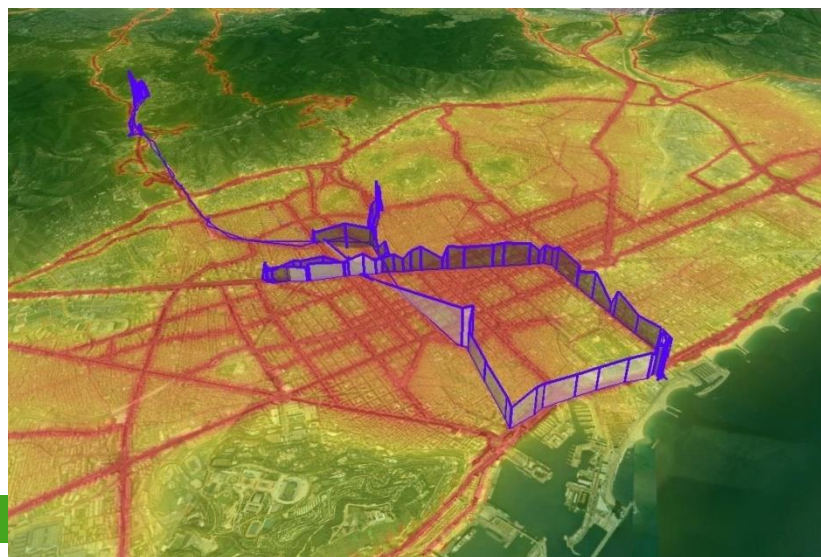
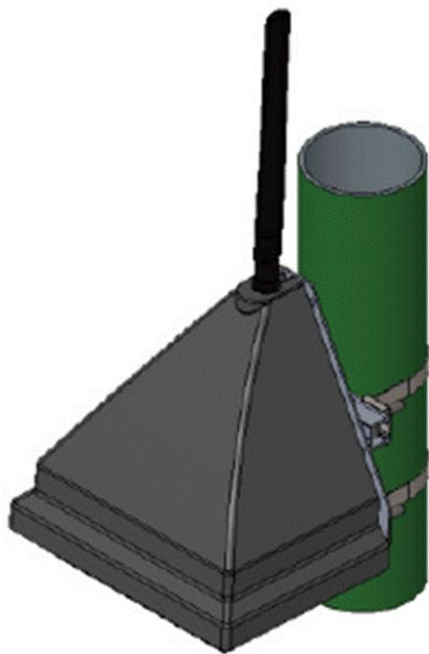
Step 2: User requests service, coordinates provided. ID 'Yes'/'No'

Step 3: Processing server fetches relevant data from DB.

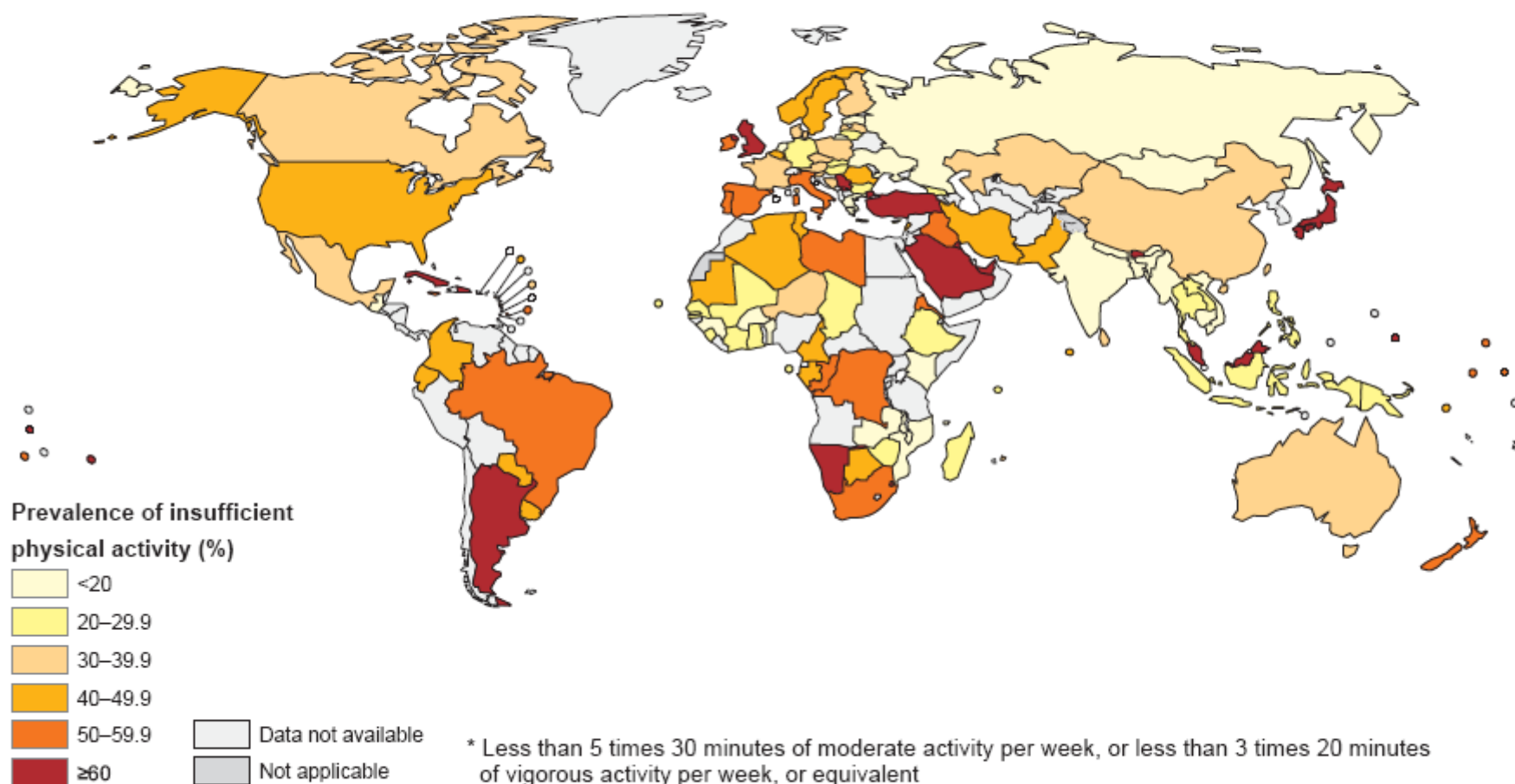
Step 4: Process server models data and stores results in DB. If unique ID supplied, this data is related to the user. If not, the data is stored only as Temp and is flushed after it has been sent.

CITISENSE AIR QUALITY APP





Prevalence of insufficient physical activity*, ages 15+, age standardized Females, 2008

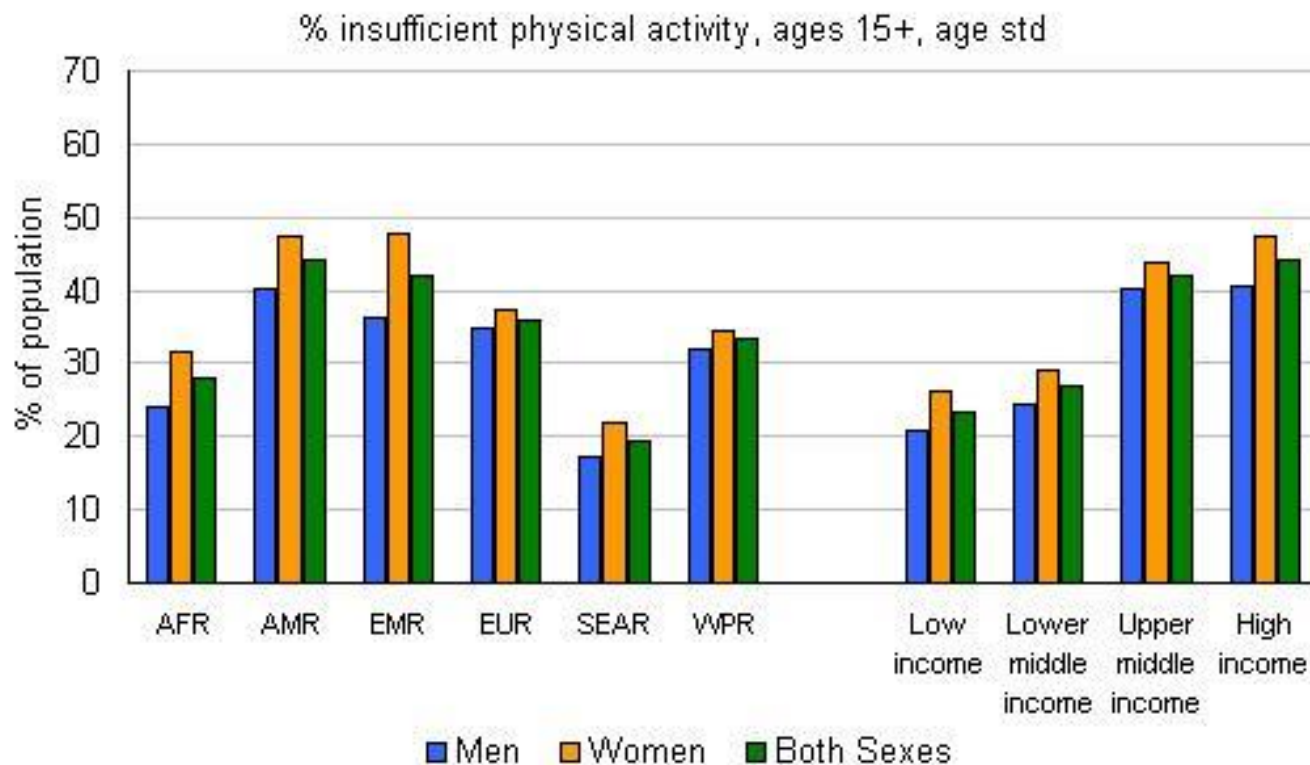


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization

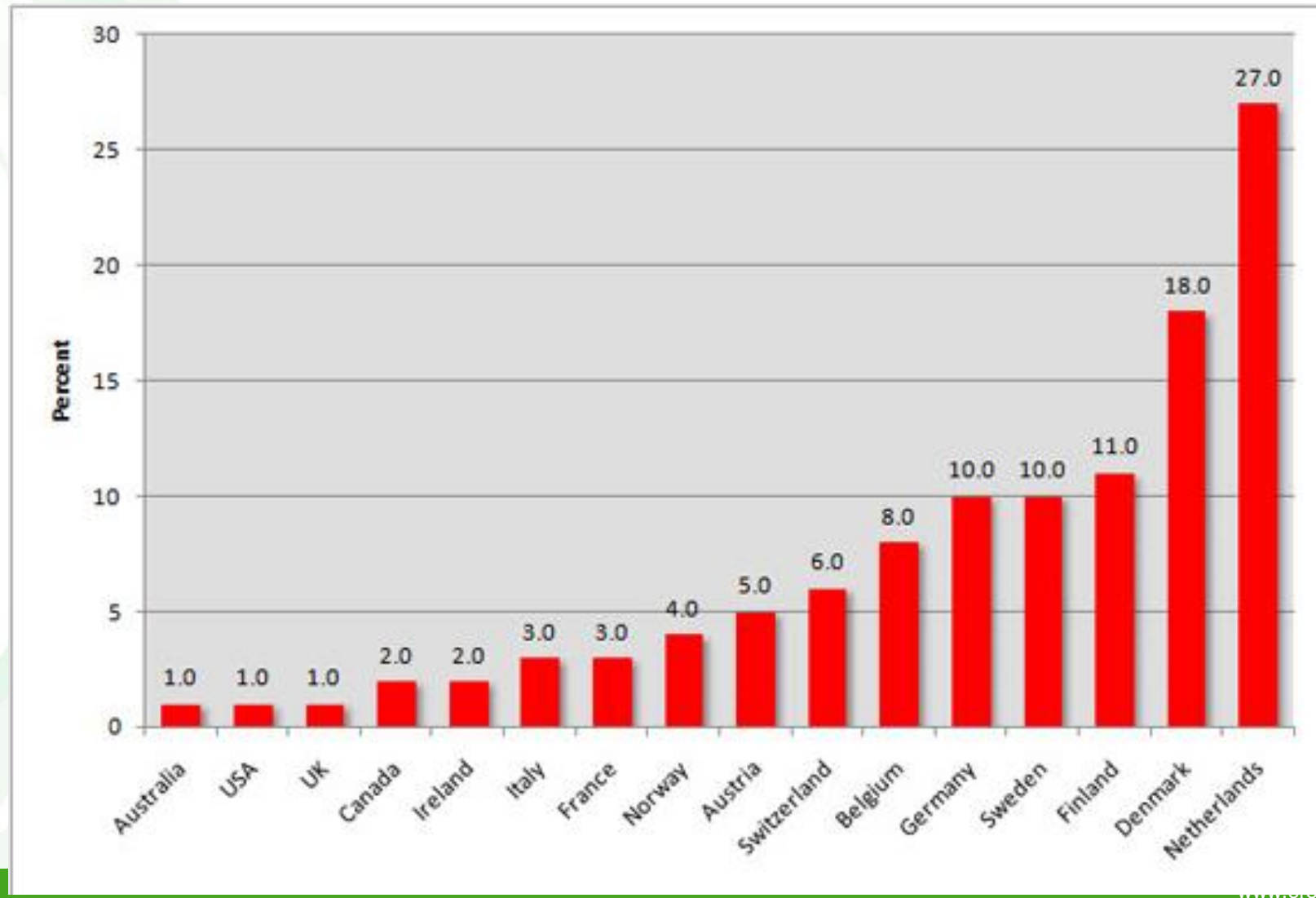


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Insufficient physical activity is the 4th leading risk factor for mortality. Approximately 3.2 million deaths and 32.1 million DALYs (representing about 2.1% of global DALYs) each year are attributable to insufficient physical activity. People who are insufficiently physically active have a 20% to 30% increased risk of all-cause mortality compared to those who engage in at least 30 minutes of moderate intensity physical activity most days of the week

PERCENTAGE TRIPS CYCLING



BARCELONA HEALTH IMPACT ASSESSMENT EXAMPLE



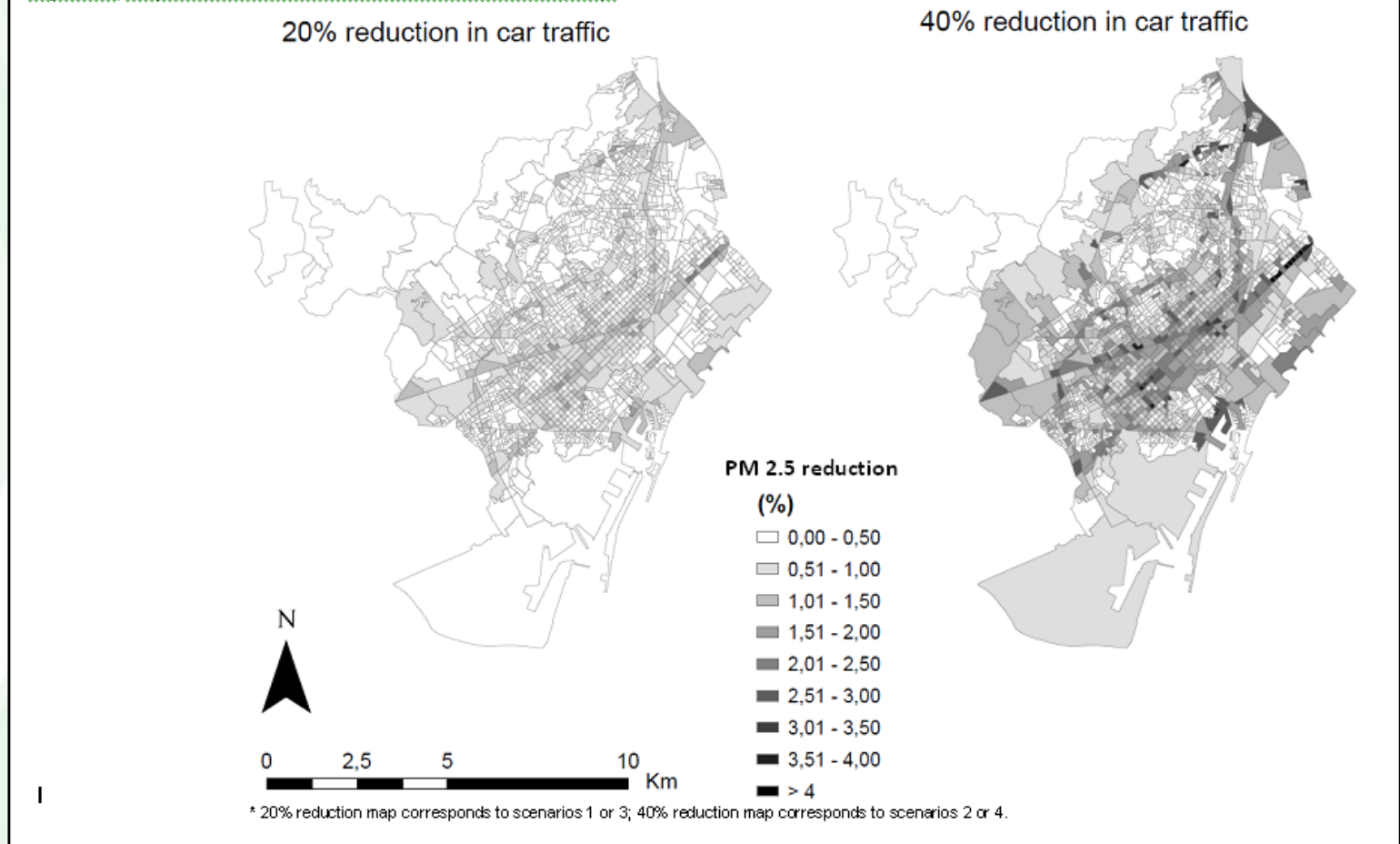
HEALTH BENEFITS OF CHANGING FROM CARS TO ACTIVE AND PUBLIC TRANSPORT

Table 1. Scenarios and results (in travellers) of replacing car trips by bike and/or public transport.

	Inside Barcelona Scenarios ^a				Outside Barcelona Scenarios ^b			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Car trips reduction	20%	40%	20% ^c	40% ^c	20% ^d	40% ^d	20% ^e	40% ^e
Trips/day replaced by Bike (%)	94,460 (100)	188,920 (100)	47,230 (50)	94,460 (50)	0	0	34,065 (20)	68,130 (20)
Trips/day replaced by Public Transport (%) ^f	0	0	47,230 (50)	94,460 (50)	170,324 (100)	340,648 (100)	136 259 (80)	272,518 (80)
Health determinants (deaths/year)								
Air pollution (PM2.5)	0.57	1.15	0.33	0.67	0.15	0.3	0.64	1.28
Road traffic fatality	0.08	0.17	-0.01	-0.02	-0.98	-1.95	-0.71	-1.43
Physical activity	-33.73	-67.46	-22.2	-44.4	-19.25	-38.5	-49.17	-98.35
Total								
Deaths/year ^g	-33.06	-66.12	-21.88	-43.76	-20.07	-40.15	-49.25	-98.5
Months gained ^h	6.5	6.5	4.7	4.7	2.8	2.8	4.7	4.7

HEALTH BENEFITS OF CHANGING FROM CARS TO ACTIVE AND PUBLIC TRANSPORT

Figure 3. Maps of PM_{2.5} reduction inside Barcelona city.

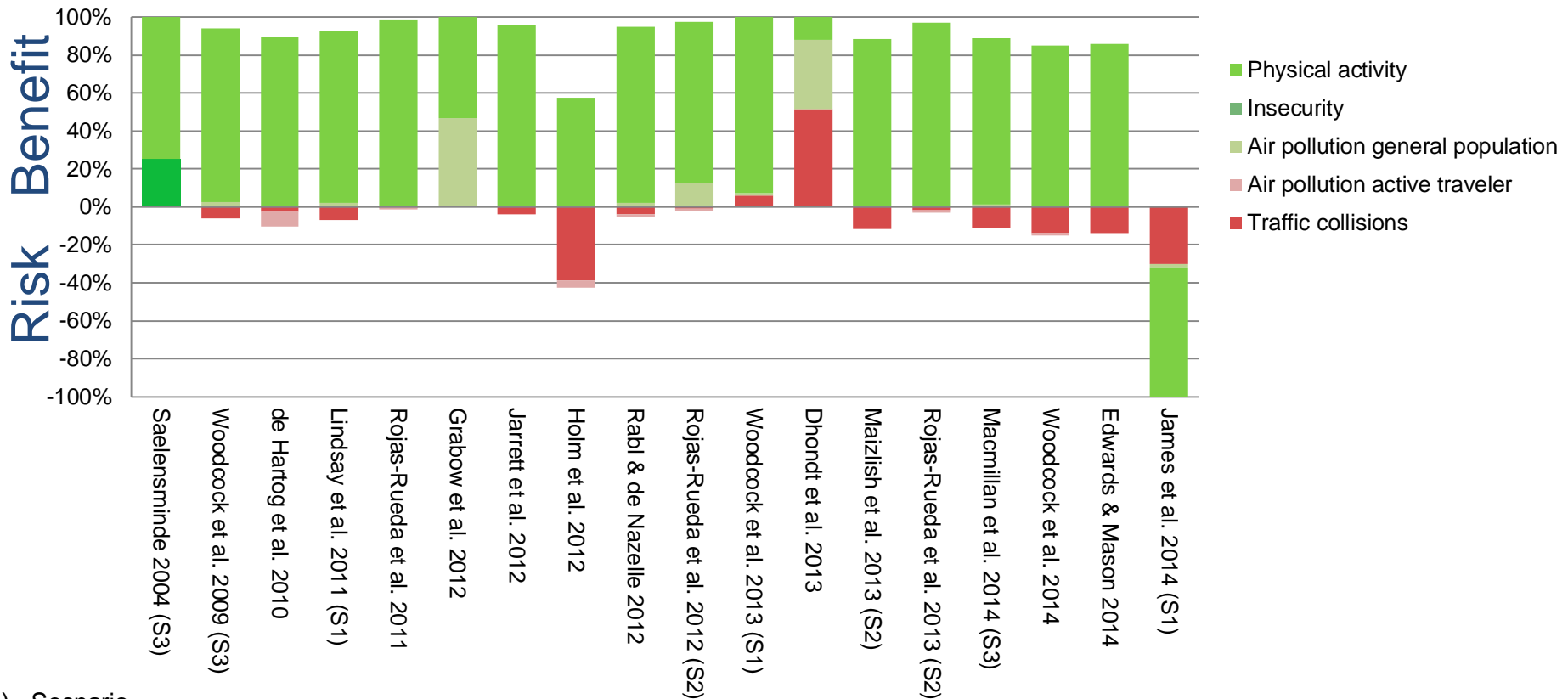


HEALTH BENEFITS OF CHANGING FROM CARS TO ACTIVE AND PUBLIC TRANSPORT

Table 3. Air pollution reductions and their impacts in general population.

Percentage of car trips reduction	PM 2.5 ^a			CO ₂ ^b	
	Reduction (µg/m ³) ^c	Percentage of reduction (%) ^d	Deaths (deaths/year)	Days gained in life expectancy ^e	Emissions avoided (ton/year) ^f
Inside Barcelona ^g					
20%	0.07	0.32	-5	1.14	21,391
40%	0.14	0.64	-10.03	2.28	42,783
Outside Barcelona ^h					
20%	0.13	0.58	-9.06	2.05	80,233
40%	0.26	1.16	-18.15	4.11	160,467

Health pathway contribution to estimated health impact ^{a,b}



(S)= Scenario

^a If study estimated multiple scenarios, health impact was calculated for most **conservative scenario** (smallest benefit-risk/ benefit-cost ratio)

^b Only calculated for studies with more than one health pathway (excluded: Mooy & Gunning-Scheppers 2001; Boarnet et al. 2008; Cobiac et al. 2009; Guo & Gandavarapu 2010; Gotschi 2011; Olabarria et al. 2012; Stipdonk & Reurings 2012; Mulley et al. 2013; Schepers & Heinen 2013; Deenihan & Caulfield 2014; Creutzig et al. 2012 excluded due to incomparable units)



REGIONAL OFFICE FOR

**World Health
Organization**
Europe



Press release

Copenhagen, Geneva and Paris, 14 April 2014

Cycling can create at least 76 600 jobs and save 10 000 lives every year in major European cities

Over 76 600 people would be employed in green and healthy transport every year and 10 000 lives would be saved if major European cities¹ reached the cycling modal share of Copenhagen. This is the conclusion of a new publication released today by UNECE and the WHO Regional Office for Europe.

For the first time, *Unlocking new opportunities*² estimates that investing in “green and healthy transport” not only has positive health and environmental effects but is also economically profitable.

www.creal.cat

Of all city trips in Copenhagen, 26% are undertaken by bicycle.



PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES



Plataforma del Questionari del Projecte PASTA

Login Català -

PASTA - Physical Activity through Sustainable Transport Approaches

Projecte d'investigació sobre l'activitat física, els hàbits de mobilitat, i els riscos d'accidents.

PASTA és un projecte d'investigació que es portarà a terme durant quatre anys en set ciutats europees (Anvers, Barcelona, Londres, Örebro, Roma, Viena i Zúric). L'objectiu és reclutar fins a 2.000 participants a cada ciutat. Prendre part és senzill: es tracta d'omplir un qüestionari electrònic sobre els seus hàbits de transport i activitat física.

La preparació de l'estudi va començar al novembre de 2013. S'espera que els qüestionaris estiguin en línia a la tardor de 2014.

Estem cercant conductors de cotxe, ciclistes, usuaris de serveis de cotxe compartit, vianants i usuaris de transport públic.

S'anima a participar a l'estudi PASTA? Si és així, envii'ns la seva informació de contacte a través d'aquest formulari de pre-registre.

La seva informació serà tractada de forma confidencial i no es cedirà a tercers.

- La campanya ha començat en aquestes ciutats. Registri's.
- La campanya està en preparació. Pre-registri's.



Plataforma del Questionari del Projecte PASTA

Personal de recerca

David - Català -

Vosté ja ha contestat aquest qüestionari. Només pot veure les seves respostes, però no modificar-les.

Llarg seguiment

50%

Recreational activities

For the next questions exclude the work and transport activities that you have already mentioned. Now think about sports, fitness and recreational activities (leisure), including going for a walk or on a bike tour.

Vigorous-intensity activities are activities that require hard physical effort and cause large increases in breathing or heart rate.

Moderate-intensity activities are activities that require moderate physical effort and cause small increases in breathing or heart rate.

Practica esports d'alta intensitat, gimnàstica o activitats de lleure durant com a mínim 10 minuts seguits? * [més informació](#)



- ☐ Sí
- ☐ No

Vosté practica algun tipus d'activitat d'intensitat moderada com ara esports, gimnàstica o activitats de lleure que durin com a mínim 10 minuts seguits? * [més informació](#)



- ☐ Sí
- ☐ No

In the last 7 days, on how many days did you do moderate-intensity sports, fitness or recreational (leisure) activities? *

Normalment, quants minuts realitza esports d'intensitat moderada, gimnàstica o activitats de lleure al dia? *

[← Previ](#)

[Següent →](#)

<http://survey.pastaproject.eu>





PHYSICAL ACTIVITY THROUGH
SUSTAINABLE TRANSPORT APPROACHES

PASTA approach: Transport & health research

7 Case Study Cities

Workshops & Interviews

**Key stakeholders
from cities:
transport & health**

Policies, strategies,
challenges, barriers,
factors of success

Longitudinal survey

**General public
(14,000)**

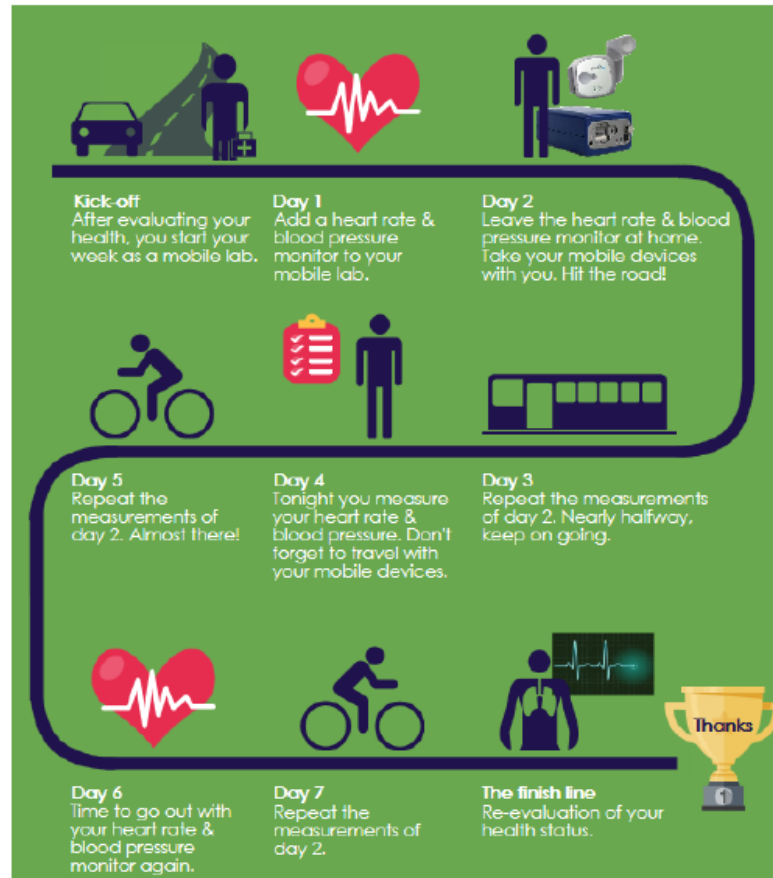
Mobility diary, physical
activity, accidents,
air pollution.

HIA – HEAT & Good practice examples

Outcome for the cities
(politicians, planners,
stakeholders)

HOW HEALTHY ARE YOU?

The measurement week



GREEN SPACE AND MENTAL HEALTH

Int. J. Environ. Res. Public Health **2015**, *12*, 4354–4379; doi:10.3390/ijerph120404354

OPEN ACCESS

International Journal of
**Environmental Research and
Public Health**

ISSN 1660-4601

www.mdpi.com/journal/ijerph

Review

Mental Health Benefits of Long-Term Exposure to Residential Green and Blue Spaces: A Systematic Review

Mireia Gascon ^{1,2,3,4,*}, Margarita Triguero-Mas ^{2,3}, David Martínez ^{2,3}, Payam Dadvand ^{2,3},
Joan Forn ^{2,3,4}, Antoni Plasència ¹ and Mark J. Nieuwenhuijsen ^{2,3}

In total 28 studies were included in the systematic review. We found limited evidence for a causal relationship between surrounding greenness and mental health in adults. Limitation: cross sectional studies

GREEN SPACE AND GENERAL AND MENTAL HEALTH INDICATORS

20% reduction per IQR

	Surrounding greenness OR [§] (95% CI)	Access to green spaces OR [§] (95% CI)
<i>Health indicators</i>		
Less than good self-perceived general health	0.90 (0.83, 0.98)*	0.95 (0.83, 1.08)
Perceived risk of poor mental health	0.79 (0.71, 0.88)*	0.93 (0.79, 1.09)
Perceived depression and/or anxiety	0.81 (0.75, 0.88)*	0.86 (0.76, 0.98)*
Visits to mental health specialists	0.80 (0.69, 0.92)*	0.79 (0.63, 0.98)*
Intake of tranquilizers or sedatives	0.88 (0.79, 0.99)*	0.93 (0.78, 1.11)
Intake of antidepressants	0.80 (0.71, 0.91)*	0.87 (0.72, 1.05)
Intake of sleeping medication	0.89 (0.79, 0.99)*	1.03 (0.86, 1.24)

[†] Models adjusted for gender, age, education, marital status, socioeconomic status, percentage of population with university studies, health insurance, origin, and degree of urbanization.

[§] Odds ratio (OR) reported for all the variables with the exception of social support, where incidence rate ratio is reported.

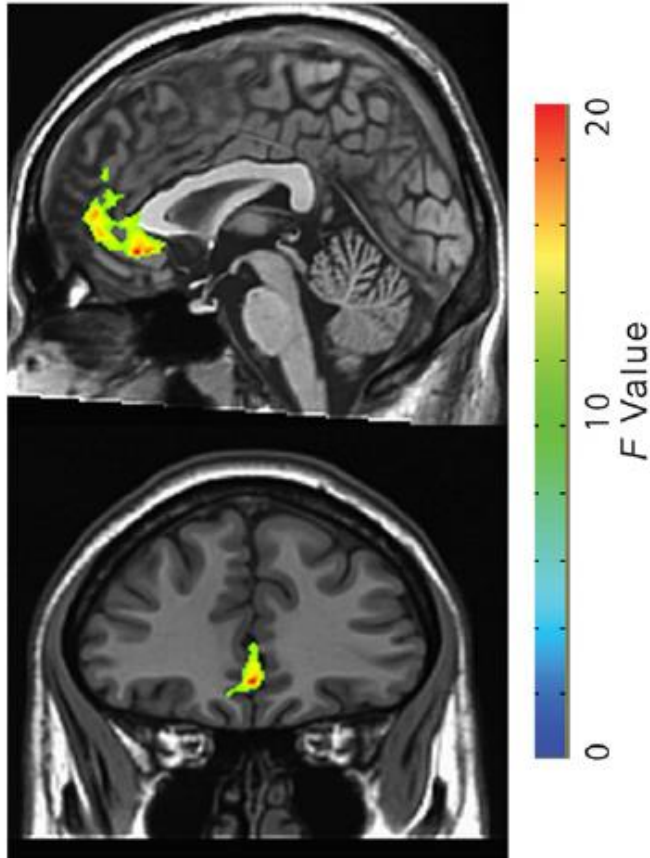
* p-value < 0.05.

n = 8793 adults

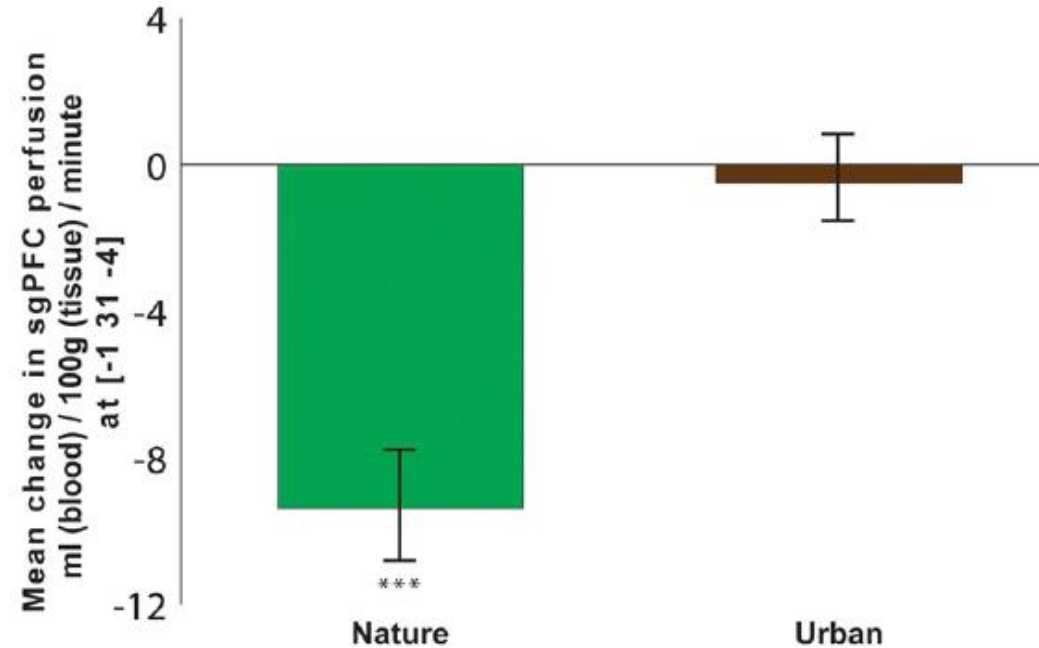
www.creal.cat

NATURE EXPERIENCE REDUCES RUMINATION AND SUBGENUAL PREFRONTAL CORTEX ACTIVATION

B



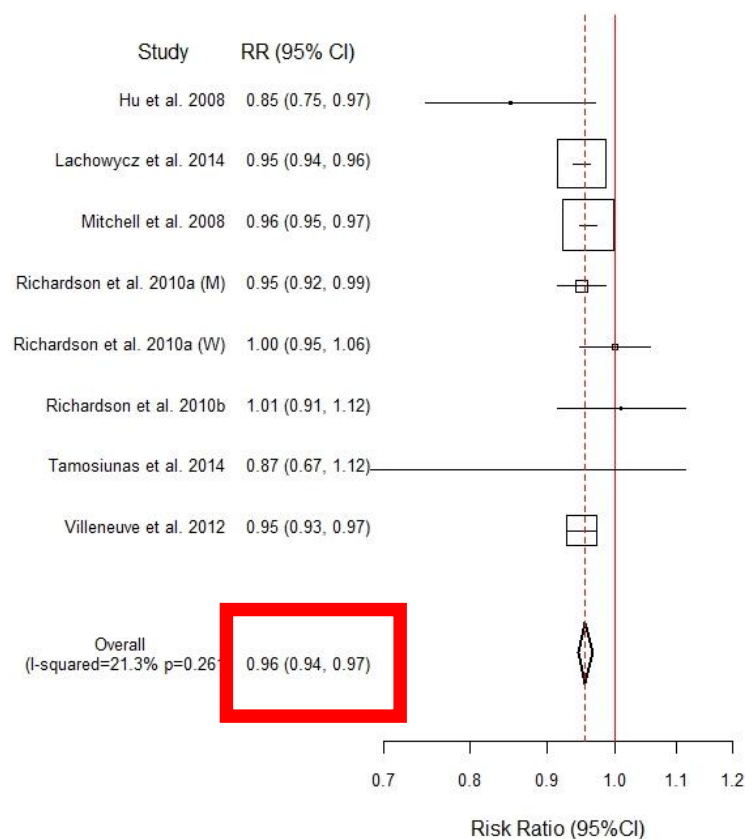
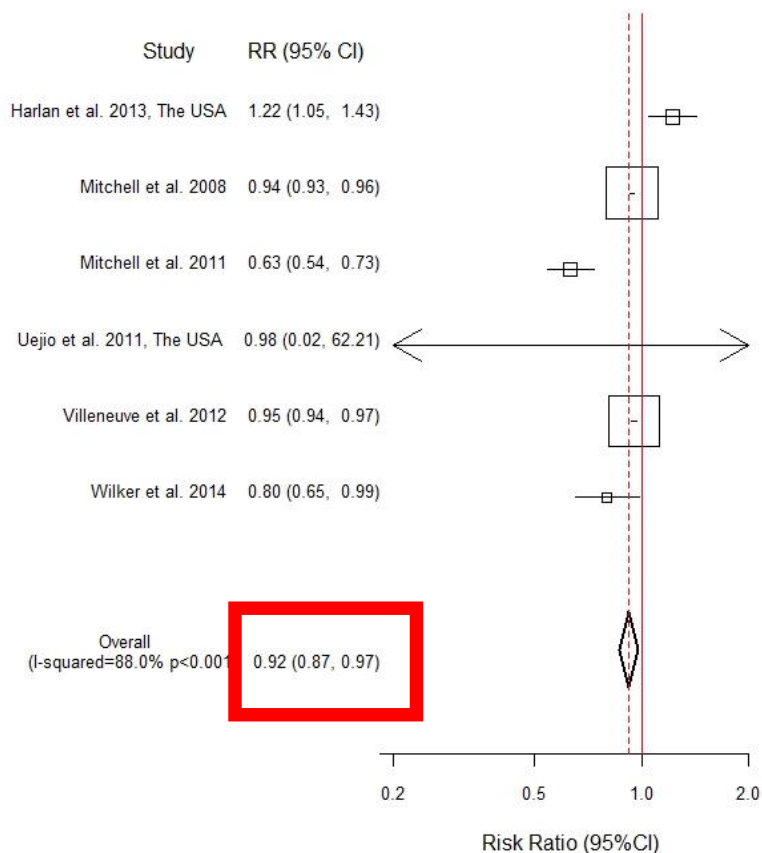
C



Rumination is a prolonged and often maladaptive attentional focus on the causes and consequences of emotions — most often, negative, self-relational emotions

Fig. 1. The impact of nature experience on self-reported rumination and blood perfusion to the sgPFC. (A) Change in self-reported rumination (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. (B) A time-by-environment interaction in blood perfusion was evident in the sgPFC. F map of significant interactions at a threshold of $P < 0.05$, FWE corrected for multiple comparisons. (C) Change in blood perfusion (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. Error bars represent SE within subjects: * $P < 0.05$, *** $P < 0.001$.

Meta-analysis All cause and cardiovascular mortality



Gascon et al 2015



Contact

Environment & Environmental V

Biodiversity

There are many other distinguished aspects that the programme has to offer such as, for example, environmental education that school children receive. They learn about the agricultural world and organic farming principles through the carrying out of different activities. At the same time an intergenerational bond is fostered, since the educational activities held in the urban gardens facilitate relationships between young children and seniors.



“L’hortet del forat”, located in La R
neighborhood (in the city center)



Figure 1. Visualisations for a typical urban terraced street. The four figures are taken from the visualisations used in the Visions 2030 Walking and Cycling Project <http://www.visions2030.org.uk/>. Each vision represents four different possibilities for urban transport in 2030 in the UK. These visualisations are of a 'typical' Victorian terraced street. Visualisations created by the School of Computing at the University of East Anglia. doi:10.1371/journal.pone.0051462.g001

L'HOSPITALET DE LLOBREGAT

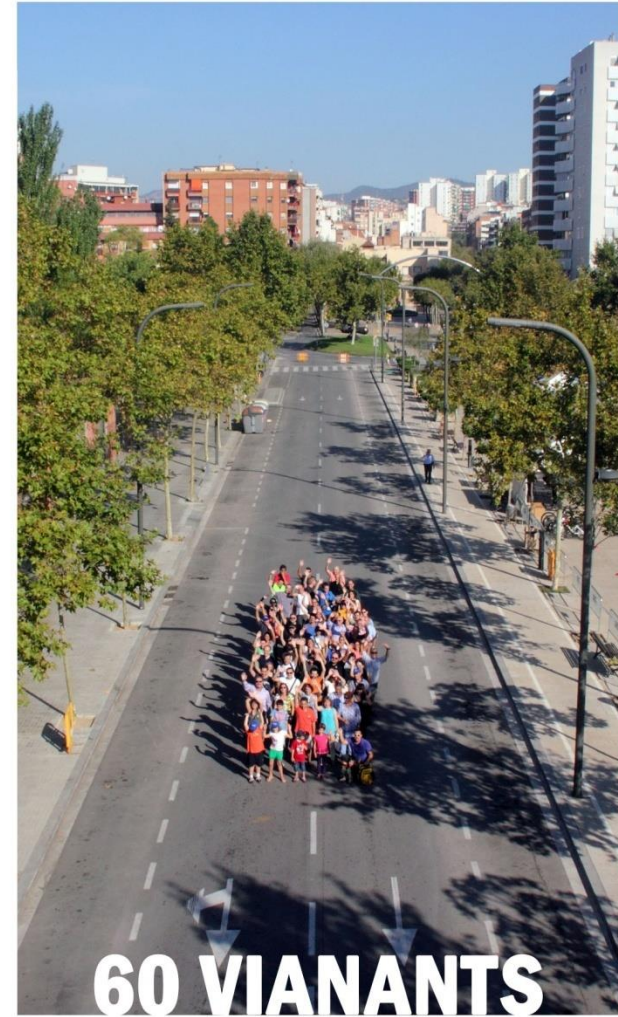
22 DE SETEMBRE DE 2013



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(Photo: [Marcia Taylor](#))


Hamburg Plans to Become Car-Free By 2034

But should there really be zero cars?

By [Rachel Nuwer](#)
SMITHSONIANMAG.COM
FEBRUARY 17, 2014

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Hamburg, Germany, recently announced plans to convert 40 percent of the city into car-free pedestrian zones within the next two decades. [According to Inhabitat](#), existing green spaces



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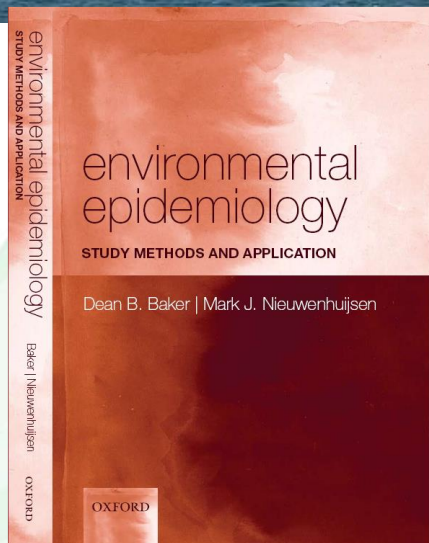
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